Total number of printed pages:4

PG/1st/PCSE102

2021

ALGORITHMS AND ALGORITHMIC COMPLEXITY

Full Marks: 100

Time: Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. a) With proper example discuss the difference between upper bound and strictly bound. 5

   b) Consider $f(n) = n^5+n^4\log n-12n^2+15$. Compute the upper bound, lower bound and strictly bound for f(n). 9

   c) Compute the relations between the following two functions in terms of upper bound, lower bound and strictly bound 6

   $f(n) = n^{53}+n^{41}-11$ and $g(n) = n^{52}\log n+1124n^{41}+15$

2 a) Judge the statement "when an array is sorted and the pivot is the first element quick sort should be avoided". Justify your answer using time complexity. (8)

   b) Consider a case when two arrays are sorted. You are asked to merge them into a single sorted array. Compute the time complexity for your problem. (5)

c) If a recursive relation $T(n)= 2T(n/2)+ n^2$, then what will be the time complexity? (7)

3 a) Use dynamic programming to solve factorial computation of a number. Compute the time complexity. (5)

b) Consider the size and profit of the following cut rod problem and compute the maximized profit using dynamic programming. (9)

Size: 1, Profit: 10

Size: 2, Profit: 18

Size 3, Profit: 21

Size 4, Profit : 36

c) Do you think instead of dynamic programming greedy method may be applied for solving the above problem? Justify your answer. (6)

4 a) Construct the following graph (8)

Vertices V ={A, B, C, D, E, F}

Edges E = {AB, AC, BC, BD, CE, CF, DF}

Weights W of the Edges = {AB = 2, AC = 1, BC =3, BD =7, CE =4, CF =1, DF =5}

Construct the MST using greedy method.

b) Solve the following TSP problem (12)

	A	B	C	D	E
A	-	10	5	2	1
B	10	-	3	4	2
C	5	3	-	1	7
D	2	4	1	-	5
E	1	2	7	3	-

5 a) The arrival and finish time of different processes are given below (7+7)

	P1	P2	P3	P4	P5	P6	P7	P8	P9
Arrival Time	2	4	6	7	3	8	8	1	10
Finish time	5	6	12	8	9	15	10	2	12

If only one processor is there, then write an algorithm such that the maximum number of processes can be

executed. Use your algorithm for solving the above mentioned problem.

b) With an example discuss why 0/1 knapsack problem can not be solved using greedy algorithm? (6)

6 a) Define the terms P, NP, NP hard and NP Complete. (4)

b) What is reduction? Discuss with example. (4)

c) Prove that 1 SAT and 2 SAT both are not NP Complete. (3+9)

7 Write short notes on (5x4)

a) Satisfiabilty Test

b) BFS and DFS

c) Cooks' Theorem

d) Branch and bound technique